Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VI SEMESTER B.TECH (MECHATRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, JULY 2016

SUBJECT: DIGITAL SIGNAL PROCESSING & APPLICATIONS [ELE 356]

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitably assumed.

1A. What is the function of parallel logic unit **(1)**

1B. Distinguish between the frequency response of Chebyshev type I filter for N odd and N even **(2)**

1C. Design a chebyshev type-I bandreject filter with the following specifications:
Passband: DC to 275Hz and 2KHz to infinity
Stopband: 550Hz to 1000Hz
αp= 1dB; αs= 15dB; Sampling frequency=8KHz **(7)**

2A. Let the contents of ARP, AR1, TREG1, ACC, Data memory location 310h be as shown in **fig Q2(A)**. After execution of the $\mathrm{LACT} * -, \mathrm{AR3}\,; (\mathrm{SXM} = 1)$ instruction, what are the contents of the above registers and memory locations? **(1)**

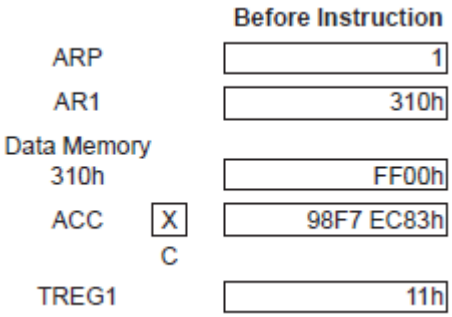

fig Q2(A).

2B. Distinguish between synchronous and asynchronous mode of operation of serial ports **(2)**

2C. Using frequency sampling method design a band reject filter with the following specifications. Sampling frequency F = 10 kHz, Cut-off frequencies fc_1 = 2000 Hz & fc_2 = 4000 Hz. Determine filter coefficients for N=7. Find H(z), Realize filter using canonic form and sketch frequency response. **(7)**

3A. What is interlocking pipeline? **(2)**

3B. An analog filter has transfer function

$$H(s) = \frac{1}{S^2 + \sqrt{2}S + 1} \quad \textbf{(3)}$$

Design a digital filter equivalent to this using impulse invariant method for sampling rate =1 sec.

3C. List the on-chip peripherals in TMS320C5X and describe their functions **(5)**

4A. A VLIW processor consists of five functional units: 2 load/store units, 1 adder unit, 1 multiplier unit. Calculate the number of cycles required to execute the following operation **(3)**

$$y = a_1 b_1 + a_2 b_2 + a_3 b_3$$

4B. Explain the application of DSP in Speech coding & Data Compression **(3)**

4C. Draw the bit pattern for ST0 & ST1 of TMS320C5X processor and explain the significance of each bit. **(4)**

5A. Compare hamming window with Kaiser window **(2)**

5B. Explain how the delayed and undelayed call and branch instructions of C5X are different in their operations? **(4)**

5C. Explain the necessity of MAC unit in DSPs. With schematic explain how saturation logic is useful in its operation. **(4)**

6A. What are the finite word length effects in digital filters **(2)**

6B. Obtain the direct form I, direct form II, Cascade and parallel form realization for the system $y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2)$ **(8)**